

WHAT IS CLAIMED IS:

1. A warpage angle measurement apparatus comprising:

a constant temperature chamber for accommodating at least one of an optical disc and a cartridge for the optical disc as an object to be measured and adjusting a surrounding of the
5 object to be measured to have a predetermined environmental condition;

a laser transmitter for causing laser oscillation to emit laser light to the object to be measured; and

a light-receiving unit for receiving the laser light
10 reflected from the object to be measured and detecting a relative angle of an optical path of the reflected laser light with respect to an optical path of the emitted laser light.

2. The warpage angle measurement apparatus according to claim 1, further comprising an arithmetic unit for calculating
15 the relative angle of an optical path of the reflected laser light with respect to an optical path of the emitted laser light based on a position on the light-receiving unit at which the reflected laser light arrives.

3. The warpage angle measurement apparatus according to
20 claim 1 or 2, wherein

the constant temperature chamber has a through hole for allowing the laser light to pass therethrough, and the laser transmitter and the light-receiving unit are arranged outside the constant temperature chamber.

4. The warpage angle measurement apparatus according to claim 3, wherein

the through hole of the constant temperature chamber is closed with a light-transmitting member.

5 5. The warpage angle measurement apparatus according to any one of claims 1 to 4, further comprising a mounting posture adjusting mechanism for holding the optical disc and the cartridge in the constant temperature chamber while the optical disc is mounted in the cartridge and for adjusting a
10 mounting posture of the optical disc in the cartridge.

6. The warpage angle measurement apparatus according to any one of claims 1 to 4, further comprising a rotating and driving mechanism for driving the optical disc to rotate.

7. The warpage angle measurement apparatus according to
15 claim 5, further comprising a rotating and driving mechanism for driving the optical disc to rotate.

8. A warpage angle measurement method comprising:
accommodating at least one of an optical disc and a cartridge for the optical disc as an object to be measured in a constant
20 temperature chamber; adjusting an inside of the constant temperature chamber to have a predetermined environmental condition; and measuring an angle of warpage of the object to be measured by emitting laser light to the object to be measured, receiving the laser light reflected from the object
25 to be measured, and detecting a relative angle of an optical

path of the reflected laser light with respect to an optical path of the emitted laser light.

9. The warpage angle measurement method according to claim 8, wherein

5 a through hole for allowing laser light to pass therethrough is provided in the constant temperature chamber so that the laser light is emitted from an outside of the constant temperature chamber to the object to be measured and the reflected laser light from the object to be measured is
10 received in the outside of the constant temperature chamber.

10. The warpage angle measurement method according to claim 9, wherein

the through hole of the constant temperature chamber is closed with a light-transmitting member so that the angle of
15 warpage of the object to be measured is measured.

11. The warpage angle measurement method according to any one of claims 8 to 10, wherein

the optical disc and the cartridge are held in the constant temperature chamber while the optical disc is mounted
20 in the cartridge, and a mounting posture of the optical disc in the cartridge is adjusted to measure the angle of warpage of the optical disc.

12. The warpage angle measurement method according to any one of claims 8 to 10, wherein
25 the angle of warpage of the optical disc is measured while the

optical disc is driven to rotate.

13. The warpage angle measurement method according to claim 11, wherein

the angle of warpage of the optical disc is measured
5 while the optical disc is driven to rotate.

14. The warpage angle measurement method according to any one of claims 8 to 10, wherein

the laser light is emitted to the optical disc through an opening for transmitting information of the optical disc
10 provided in the cartridge while the optical disc is mounted in the cartridge, and the reflected laser light from the optical disc is reflected to an outside of the cartridge.

15. The warpage angle measurement method according to claim 11, wherein

15 the laser light is emitted to the optical disc through an opening for transmitting information of the optical disc provided in the cartridge while the optical disc is mounted in the cartridge, and the reflected laser light from the optical disc is reflected to an outside of the cartridge.

20 16. The warpage angle measurement method according to any one of claims 8 to 10, wherein

an opening for measurement is formed in the cartridge, the laser light is emitted to the optical disc through the opening for measurement while the optical disc is mounted in
25 the cartridge, and the reflected laser light from the optical

disc is reflected to an outside of the cartridge.

17. The warpage angle measurement method according to claim 11, wherein

an opening for measurement is formed in the cartridge,
5 the laser light is emitted to the optical disc through the opening for measurement while the optical disc is mounted in the cartridge, and the reflected laser light from the optical disc is reflected to an outside of the cartridge.

18. The warpage angle measurement method according to any
10 one of claims 8 to 10, wherein

two constant temperature chambers are prepared and environmental conditions inside the two constant temperature chambers are set to have a different environmental condition from each other, and

15 the object to be measured is first accommodated in one of the two constant temperature chambers and is then carried into the other constant temperature chamber and thereafter the angle of warpage of the object to be measured is measured.

19. The warpage angle measurement method according to
20 claim 11, wherein

two constant temperature chambers are prepared and environmental conditions inside the two constant temperature chambers are set to have a different environmental condition from each other, and

25 the object to be measured is first accommodated in one of

the two constant temperature chambers and is then carried into the other constant temperature chamber and thereafter the angle of warpage of the object to be measured is measured.

20. The warpage angle measurement method according to
5 claim 12, wherein

two constant temperature chambers are prepared and environmental conditions inside the two constant temperature chambers are set to have a different environmental condition from each other, and

10 the object to be measured is first accommodated in one of the two constant temperature chambers and is then carried into the other constant temperature chamber and thereafter the angle of warpage of the object to be measured is measured.

21. The warpage angle measurement method according to
15 claim 14, wherein

two constant temperature chambers are prepared and environmental conditions inside the two constant temperature chambers are set to have a different environmental condition from each other, and

20 the object to be measured is first accommodated in one of the two constant temperature chambers and is then carried into the other constant temperature chamber and thereafter the angle of warpage of the object to be measured is measured.

22. The warpage angle measurement method according to
25 claim 16, wherein

two constant temperature chambers are prepared and environmental conditions inside the two constant temperature chambers are set to have a different environmental condition from each other, and

- 5 the object to be measured is first accommodated in one of the two constant temperature chambers and is then carried into the other constant temperature chamber and thereafter the angle of warpage of the object to be measured is measured.